California Energy Commission
Public Interest Energy Research (PIER) Program
Transportation Energy Research

California Initiative for Large Molecule Sustainable Fuels

Research Powers the Future
PIER Transportation Research
www.energy.ca.gov/research/transportation

March 2012

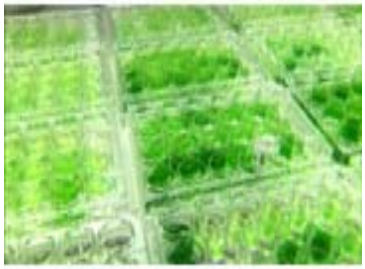
Fact Sheet

The Issue

Conventional petroleum-based transportation fuels —such as gasoline and diesel— are non-renewable, harm air quality, and contribute to climate change by releasing carbon from petroleum fuel into the atmosphere. Reliance upon these fuels stands in the way of California's energy independence. Liquid fuels produced from biomass have the potential to replace petroleum transportation fuels. Moreover, the State has a vital interest in retaining California's preeminence in this field of technology, creating green jobs through these technologies, and supporting those technologies best suited to California's unique situation and needs.

Project Description

This project will promote research and development for renewable, low carbon, drop-in large molecule fuels that are fungible with conventional petroleum based gasoline, diesel, and jet fuels, to meet California's transportation needs. (The term "large molecule" was chosen to describe these fuels, which are mixtures of molecules larger than ethanol, today's most common alternative fuel. The Energy Commission and UC San Diego specifically use this phrase, because common terminology in this field changes rapidly.) In accordance with the *State Alternative Fuels Plan*, these large molecule fuels must be compatible with existing fuel refining and distribution infrastructure. Also, production of these fuels should not compete with food production.



Laboratory algae cultures
Source: David R. Effross

Jatropha fruit
Source: David R. Effross

The California Initiative for Large Molecule Sustainable Fuels will:

- Develop advanced tools, protocols, and industrial processes to make renewable, fungible large-molecule fuels viable for large-scale commercial production.
- Identify existing challenges to the economic viability of large molecule fuel production from sources that do not compete with food production.
- Develop enhanced capability to effectively assess related emerging biofuel technologies.
- Begin training a workforce ready to staff this industrial sector as it develops.
- Produce economically significant spinoff technologies and coproducts that will enable renewable production of a variety of bioproducts, such as:

  a) Green chemistry, including biological alternatives for existing environmentally unfavorable processes for creating industrial chemicals.
  b) New wastewater remediation methods and processes.

c) Bio-polymers, including bioplastics and biodegradable polymers.
d) Industrial enzymes.
e) Nutraceuticals (foods or food products that provide health and medical benefits, including the prevention and treatment of disease).
f) Enhanced animal feeds.
g) Human and animal therapeutics (for example, drugs).

Anticipated Benefits for California

This program benefits California by reducing foreign petroleum dependence, adding corresponding improvements to economic security. This research also reduces environmental and public health risks by reducing greenhouse gas emissions and criteria pollutant emissions, as well as diversifying the transportation energy supply. The California Initiative for Large Molecule Sustainable Fuels will operate from a platform of technology neutrality, involving research scientists from the fields of biology, chemistry, bioengineering and chemical engineering, with a primary mission to develop the knowledge, tools, and industrial practices that will produce economically viable and fungible large molecule fuels from sustainable renewable sources.

The establishment of California Initiative for Large Molecule Sustainable Fuels will:

- Further California's position as a leader in the development and production of alternative renewable low-carbon fuels.
- Help decrease the carbon footprint of transportation fuels in California.
- Help establish a robust workforce training program that can supply the needed personnel for this new green collar industry.

Project Specifics

Agreement Number: 500-10-039
Contractor: UC San Diego
City/County: San Diego/ San Diego County
Application: Statewide
Amount: $2,000,000
Cofunding: $1,999,998
Term: December 2010 to June 2014

For more information, please contact:

David R. Effross
California Energy Commission
PIER Program, Transportation Research Area
Phone: 916-327-1314
E-mail: deffross@energy.state.ca.us